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(54) Apparatus for washing the window glass of a vehicle.

(57) An apparatus for washing the window glass of a vehicle comprises an intermediate container (4) preferably having an insulated construction and an electric heater (5) which is connected to both a main tank (1) for storing unheated washing fluid and an outlet (2) from which the heated washing fluid is sprayed onto the glass. When the vehicle is started, the heater is turned on as well. The washing fluid is thereby continuously heated to a required temperature and held in the intermediate container. As a result, it is possible to spray a required quantity of heated washing fluid at any time without excessive loading strain on the vehicle's battery and without excessive power consumption.

EP 0 456 934 A1

The present invention relates to apparatus for washing vehicle windows.

In cold areas, moisture formed on the windshield of vehicles such as automobiles can freeze into ice, obstructing vision. Additionally, oily film on the window glass may obstruct vision, especially at night. Obstructed vision makes driving dangerous.

Ice on the windshield hinders movement of the windshield wipers, reducing their efficiency in cleaning the windshield glass. Snowfall in the path of the wiper blades may hinder the operation of the wipers as well Inoperable windshield wipers can lead to a diminishec field of view and make driving dangerous.

To prevent these problems, heated window washing fluid has been employed. Typically, battery power or the remaining heat from warm engines has been used to heat the washing fluid. Battery powered heating can require a large amount of power over a very short time, creating too heavy a load on the battery. Using leftover heat from the vehicle's engine requires mechanisms that are often quite complicated in their design. Thus, it is difficult to supply a large quantity of heated washing fluid quickly.

The present invention provides an apparatus for washing window glass of a vehicle, said apparatus comprising a main tank for storing washing fluid, an outlet for spraying washing fluid onto the glass, and an intermediate container for heating and storing washing fluid, said intermediate container being connected between said tank and said outlet, and a heater for heating the fluid in said intermediate container. This arrangement makes it possible to spray, at a required time, a quantity of heated washing fluid which is great enough to wash the window glass yet does not drain the battery excessively.

Figure 1 is a cross sectional view of the present invention including a main tank, an intermediate container and heating apparatus, and an outlet for spraying heated washing liquid onto the window glass.

Figure 2a is a front view of the outlet for spraying heated washing fluid.

Figure 2b is a perspective view of the washing fluid being sprayed onto the window glass.

Figure 1 shows a cross sectional view of the present invention for washing the window glass of a vehicle. There is a tank 1 containing washing fluid 16 connected by a conduit 3 to an intermediate container 4 for heating the liquid 16. Container 4 also stores the heated liquid 16 until it is needed. Container 4 is in turn connected by a conduit 3' to an outlet 2 for spraying the washing fluid onto the window glass.

The main tank 1 holds washing fluid 16 in a 1000 ml polyethylene cartridge 17 with a round horizontal cross section. This is inserted into a holder 18. The holder 18 is connected to a cover 23 by a hinge 22 to allow easy access for replacement of the washing fluid cartridge 17. Extending through the bottom of the cover 18 is a drain pipe 24 for waste fluid 16. The cover 23 has a sharp protrusion 21' from its bottom surface which breaks through the top of the cartridge 17 to provide an air hole for ventilation. When the cartridge is initially inserted into the holder 18, a sealed discharge opening 19 protrudes from the bottom of the cartridge 17. This discharge opening 19 is threadedly inserted into an orifice 20 in the bottom of the holder 18. A sharp protrusion 21 extends from the bottom of the holder 18 into the threaded orifice 20. The tip punctures the sealed discharge opening 19, allowing the fluid 16 contained within the cartridge 17 to flow. Fluid flows from the cartridge 17 through a pump 10 and a check valve 11 before entering the conduit leading 3 to the intermediate container 4.

The intermediate container 4 is a 500 ml stainless steel cylinder constructed in vacuum bottle fashion. It is insulated by a cover 7 which seals the top of the container 4. A coiled electric heater 5, for heating the washing fluid 16 in the intermediate container 4, is incorporated in the lower portion of the container 4. The circuit of the electric heater 5 extends through the insulating cover 7 and is connected to a battery (not shown). A pipe 8 conducts washing fluid 16 from conduit 3, through the cover 7, to the bottom of the intermediate container 4. The pipe 8 thus feeds cold washing liquid 16 into the bottom of the intermediate container 4, near the heater 5. Another pipe 9 extends through the cover 7 a short distance into the top of the intermediate container 4 and discharges warmed washing fluid 16 via a conduit 3'. Conduit 3' then guides the heated liquid 16 to an outlet 2. Additionally, a temperature sensor 14 and a pressure valve 15 extend through the insulating cover 7 such that each can sense the washing liquid 16 inside the container 4 and yet can be set outside the container 4. Inside the intermediate container 4, three porous baffleplates 6 are arranged horizontally above the heater to prevent too rapid convection of the washing liquid 16.

The intermediate container 4 is continually replenished with washing liquid 16. There is a volume sensor 12 at the end of the outlet pipe 9 to determine whether or not the container 4 is full. The main tank 1 for cleaning liquid 16 is placed above the intermediate container 4 such that gravity insures that the intermediate container 4 remains full even without the action of the pump 10. This is important, for example, if heated liquid 16 evaporates during a long period when the pump 10 is not activated.

When the vehicle is started, the heater 5 is activated. The washing fluid 16 in the intermediate container is heated to 70 degrees Celsius. The temperature is controlled by the temperature sensor 14. The injection and mixing of fluid from the unheated main tank 1 with heated fluid in intermediate container 4 slightly reduces the temperature of the fluid in the intermediate container 4. Subsequently, the temperature sensor 14 activates the heater 5 to warm the cooled mixture to 70 degrees Celsius. When the temperature sensor 14 registers 70 degrees Celsius, the heater 5 is automatically turned off. For automobiles, a 12 volt/40 amp battery is typically used, putting out 40 amps of direct current to heat the washing fluid 16 in the intermediate container 4. The heated washing fluid is then held in the intermediate container 4 for later use. Thus, the intermediate container 4 has a ready supply of heated washing fluid 16.

When heated washing fluid is called for, the pump 10 is activated, pumping liquid 16 from the main tank 1 into the bottom of the intermediate container 4, forcing overflow washing fluid 16 from the top of the intermediate container 4 to leave the intermediate container 4 through outlet pipe 9. The washing fluid 16 is conveyed through conduit 3' to the outlet 2, where it is sprayed, under pressure from the fluid behind it, onto the window glass. The conduit 3' between the intermediate container and the outlet 2 is covered with insulating material 13 to insure that the heated washing fluid remains warm as it travels to the outlet 2.

Figure 2a shows a front view of the outlet 2 for the washing fluid. There is an elliptical ejection hole 2' arranged horizontally. Figure 2b shows a perspective view of a set of outlets 2 in operation. Each outlet sprays cleaning fluid 16 toward the glass 25 from its ejection hole 2'. The glass 25 is located such that the spray reaches the glass in the form of an expanded ellipse 16 parallel to the outlet ellipse 2'. For example, the spray on the window glass from a typical size window washing liquid outlet 2' on an automobile will cover an area 300 mm wide and 200 mm high.

The above description of the invention is for automobiles of compact or typical passenger size. For larger vehicles, such as trucks or busses, the capacity of the intermediate container may be increased to 2000 ml and a 24 volt/ 60 amp battery may be used to heat the washing fluid. Additionally, the main tank 1 can be of any sort, not necessarily employing a cartridge.

The heating apparatus only operates when it is switched on. Thus, the washing fluid may be sprayed in the same manner without being heated. However, with the heater in operation, the perpetually filled intermediate container 4 insures that heated washing fluid is instantly ready for use. There is no need for a great surge of power to instantaneously heat cold fluid since a store of heated washing fluid is perpetually replenished in the intermediate container 4. Thus, excessive loading of the battery is avoided. Additionally, the insulating covering 13 of the conduit 3' from the intermediate tank 4 to the outlet 2 insures that no radiation of heat occurs during transport of the washing fluid through the conduit 3'.

Heated washing fluid sprayed over a wide area of the window glass not only cleans the glass, it melts ice and snow allowing easier movement of the windshield wipers in the case of freezing weather. This, in turn, allows the washing apparatus to perform more effectively.

Claims

1. An apparatus for washing window glass of a vehicle, said apparatus comprising a main tank (1) for storing washing fluid, an outlet (2) for spraying washing fluid onto the glass, and an intermediate container (4) for heating and storing washing fluid, said intermediate container being connected between said tank and said outlet, and a heater (5) for heating the fluid in said intermediate container.

2. The apparatus of Claim 1, wherein said heater (5) is positioned within said intermediate container (4) and connected to be energized by an electrical system in said vehicle.

3. An apparatus according to either preceding claim, wherein said intermediate container (4) is insulated to minimize heat loss therefrom.

4. An apparatus according to any preceding claim, further comprising a pump (10) for pumping washing fluid through the apparatus to cause heated washing fluid to be sprayed from said outlet (2) onto the glass.

5. An apparatus according to Claim 4, wherein said main tank (1) is located above said intermediate container (4) when the apparatus is mounted in a vehicle so that washing fluid will flow by gravity from said main tank to said intermediate container during pumping.

6. An apparatus according to any preceding claim, further comprising a transfer conduit means (3,8) for introducing washing fluid from said main tank (1) into the lower portion of said intermediate container (4), and an outlet conduit (3) extending from an upper portion of said intermediate container to said outlet (2) whereby unheated fluid conducted into said

intermediate container is mixed with heated water in the container before reaching the outlet conduit.

7. An apparatus according to any preceding claim, wherein the intermediate container is provided with a pressure valve (15) and a temperature sensor (14).

8. An apparatus according to any preceding claim, wherein the intermediate container is provided with a volume sensor (12) for determining whether or not the intermediate container (4) contains a required amount of washing fluid.

9. A method of providing a quantity of heated washing fluid for washing window glass in a vehicle, the method comprising the steps of placing washing fluid into a main tank (1), conducting washing fluid from the main tank to an intermediate container (4), heating the washing fluid in said container, and pumping the heated fluid from said intermediate container to an outlet (2), and spraying the heated fluid from the outlet onto said glass.

FIG.1

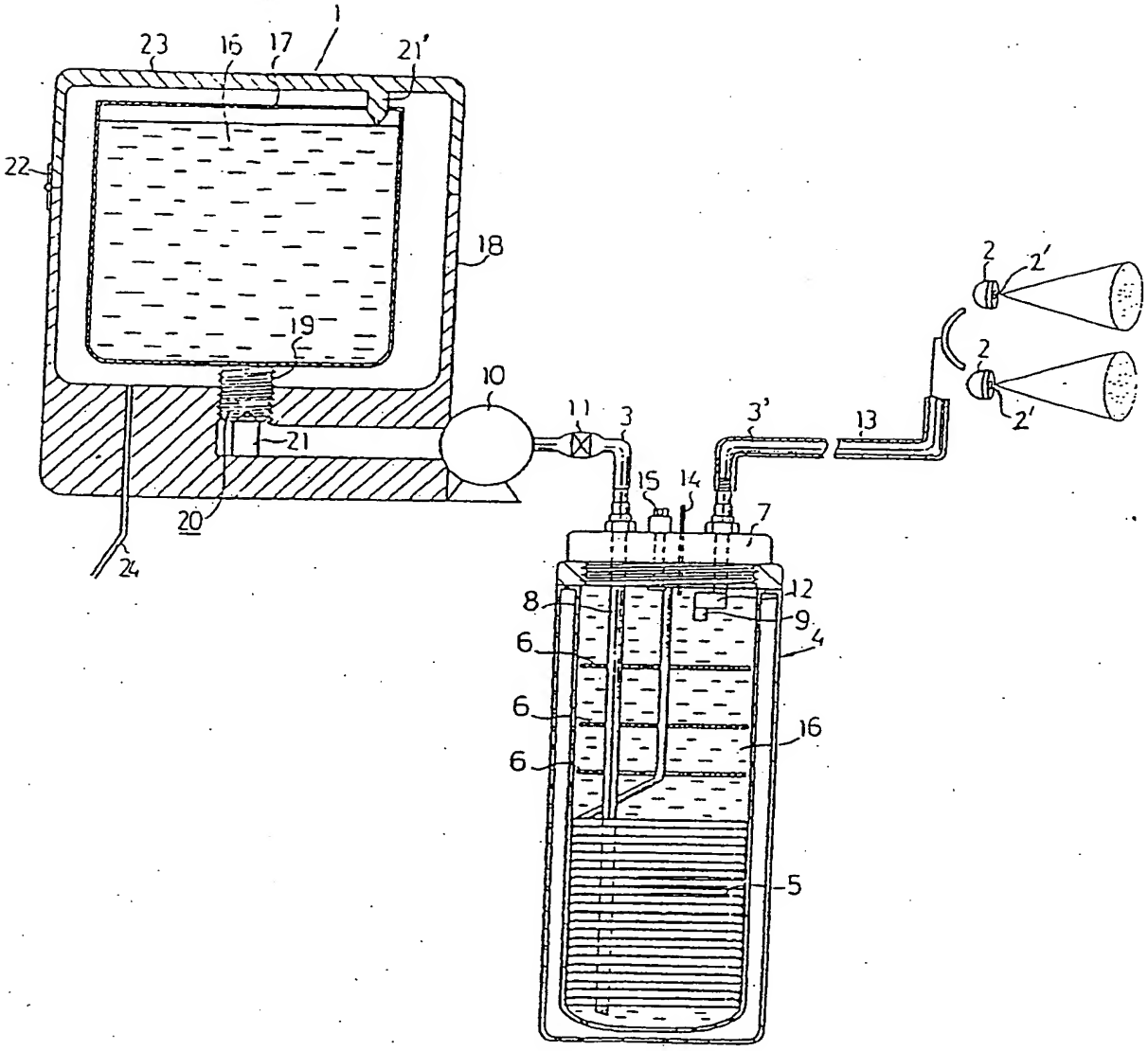
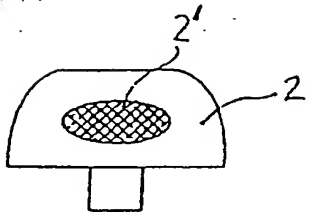
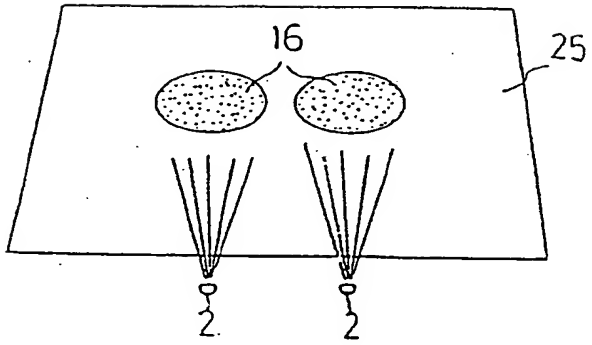


FIG. 2

(a)



(b)



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EUROPEAN SEARCH REPORT

Application Number

EP 90 31 2450

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X,Y	DE-A-2 651 285 (BECKER) * the whole document *	1-3,6,9,7,8	B 60 S 1/46
X,Y	FR-A-1 460 494 (LUPTAK) * page 3, column 1, lines 39 - 57; figure 2 *	1,2,4,6,9,7,8	
X,Y,A	GB-A-1 451 666 (ASSOCIATED ENGINEERING LIMITED) * page 2, lines 11 - 87 * * page 3, lines 32 - 69; figures 1, 5 *	1,3,4,6,9,7,8,2	
X,Y	DE-A-3 611 921 (BOCK) * the whole document *	1,4-6,9,8	
X,Y	FR-A-2 122 239 (CODELUPPI) * page 3, lines 22 - 34; figure 1 *	1,2,4,9,7,8	
Y	EP-A-0 234 117 (OKUMURA) * column 3, line 53 - column 4, line 30 * * column 5, line 6 - column 6, line 31; figure 1 *	7	
Y	PATENT ABSTRACTS OF JAPAN vol. 10, no. 167 (M-488)(2223) 13 June 86, & JP-A-61 18543 (NAIRUSU BUHIN) 27 January 86, * the whole document *	8	
X,Y,A	FR-A-2 636 903 (PEUGEOT, CITROEN) * page 3, line 26 - page 6, line 30; figures 1, 2 *	1,3-6,9,8,2	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
B 60 S

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	28 August 91	VERLEYE J.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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